

CLASSIFICATION

There are two major groups of fishes. Those with cartilaginous skeletons, such as sharks and rays, live almost exclusively in ocean or brackish waters. Those with bony skeletons live both in marine and fresh waters, and are by far the more numerous. In addition, a group of more primitive animals, including the lampreys and hagfishes, are sometimes erroneously considered as fish.

A number of characteristics are used to classify fishes into separate categories. Most of these characteristics are external and quite obvious, although some are internal and not so easy to observe. Those external characteristics that are used to distinguish our freshwater nongame fishes are shown on the accompanying diagram.

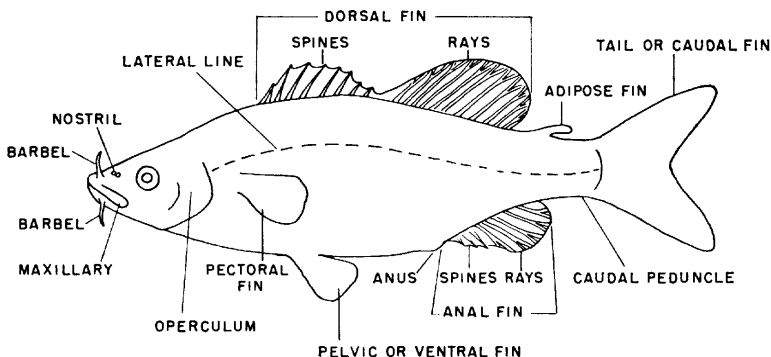
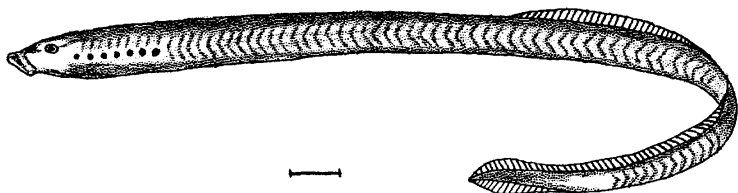


Diagram of a hypothetical fish, showing features mentioned in the text. (Not all of these features will be found on any one kind of fish.)

PACIFIC LAMPREY
Entosphenus tridentatus

Entosphenus = wedge-shaped
tridentatus = three-toothed



DISTINGUISHING CHARACTERISTICS

Lampreys are not true fish. They are the most primitive form of living vertebrates. They have no bones, the skeleton being composed of cartilage. Lampreys have long, round, eel-like bodies that are slimy to the touch. The head is short, with a round sucking mouth lacking functional jaws. The mouth is surrounded by a horny sucking disk. The tongue has rough, rasping teeth. There are no paired fins. A row of seven gill pores on each side of the body starts just behind the eye. Pacific lamprey adults attain a length of about two feet. They range in color from dark bluish to brownish grey.

DISTRIBUTION IN CALIFORNIA

The Pacific lamprey is found in nearly all California streams entering the Pacific Ocean, unless blocked by barriers or low flows. It ranges northward to Alaska.

GENERAL INFORMATION

The adults often start their spawning migration from the ocean into fresh water in the fall, and can be seen moving upstream throughout the winter and early spring except during high water. In some rivers these migrations continue into late spring.

Great, wriggling masses of lampreys are often seen ascending barriers and fish ladders on coastal streams in the early spring. They negotiate these barriers in a remarkable fashion. In many cases the flow is too great for the fish to move across the barrier in one attempt. They solve the problem by swimming until tired, then attaching themselves to the bottom or sides with their mouths and resting for a while. When recovered, they make another attempt and move upstream several more feet. In this manner, by successive spurts and resting periods, they move over various obstructions until they reach their spawning grounds.

Lampreys construct nests for spawning. They dig shallow depressions in stream riffles by moving stones with their suctorial mouth. The eggs are

deposited in the crevices of the rocky nest area, after which the adults die. The eggs hatch and the young lampreys burrow into the stream bottom, where they remain in a larval stage for three or four years. During this time, they feed on material they filter from the water and gradually change into miniature adults. At a length of about 6 inches, they move into the stream and migrate to the ocean. They may become parasitic at this time, or possibly wait until they reach salt water before attaching themselves to another fish for a feast. A landlocked population of Pacific lamprey is present in the Klamath River system above Copco Dam.

IMPORTANCE

The Pacific lamprey parasitizes other fishes, notably striped bass and salmon, but without the disastrous results caused by another species, the sea lamprey, to lake trout in the Great Lakes. Lampreys are edible, of good flavor, and are used as food particularly by some coastal Indian tribes. The flesh is rich and oily, ideal for smoking.

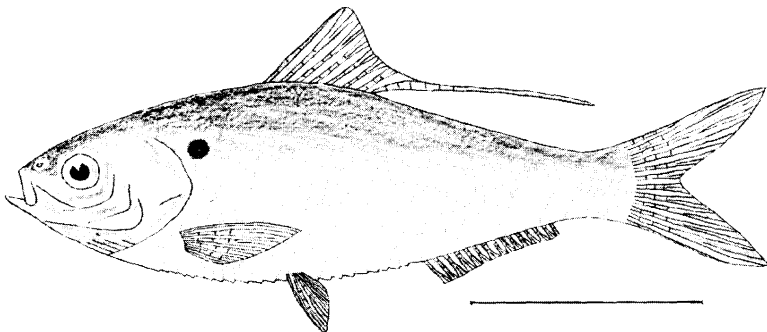
RELATED SPECIES

The river lamprey, *Lampetra ayresii*, (*Lampetra* = a sucker of stone; *ayresii* = after Dr. W. O Ayres) is a small parasitic form that is found from Central California northward at least as far as British Columbia. Very little is known of its habits or behavior. It is probably responsible for most of the lamprey attacks on fish in California streams.

The brook lamprey, *Lampetra planeri*, (*planeri* = after J. J. Planer, a German botanist) is the smallest of our lampreys. It occurs from California northward through Canada and Alaska into Siberia and Europe. It spends its entire life in fresh water instead of going to the sea upon changing to the adult form. It is nonparasitic and does not feed after reaching maturity.

THREADFIN SHAD *Dorosoma petenense*

Dorosoma = lance body
petenense = Lake Peten, Yucatan



DISTINGUISHING CHARACTERISTICS

The threadfin shad belongs to the herring family, which has both freshwater and marine representatives. It is a small, thin, silvery fish with a saw-toothed edge on the belly. It varies from yellowish green to bluish green on the back. A dark spot just behind the head is distinctive. The last dorsal fin ray is greatly elongated. The fins have a yellowish-green appearance in the water. The threadfin resembles a small American shad in shape. The stomach is gizzard-like.

DISTRIBUTION IN CALIFORNIA

Threadfin shad were introduced from Tennessee in 1953. They were put into San Vicente Reservoir, San Diego County, and Lake Havasu on the Colorado River to provide forage for game fish. They are now present throughout the Los Angeles Metropolitan Water District system and the area serviced by the All-American Canal. They have been introduced into numerous northern California reservoirs and are found also in the Sacramento-San Joaquin Delta.

GENERAL INFORMATION

Threadfin shad are known as "particulate" feeders; in other words, they select their food in the water. This is rather astonishing since the food consists of plankton organisms, many of which are no larger than the head of a small pin.

Threadfin spawn both in open water and near shore. The eggs are sticky and they cling to all manner of things. They can also develop and hatch

without ever touching anything. In one reservoir the eggs were found to sink to a point in the reservoir where their density maintained them in a specific temperature band. They hatched and for some days the helpless larvae could be captured by lowering a net to that depth. Some of the first threadfin shad eggs found in California were attached to the downy portion of a sea gull feather floating in San Vicente Reservoir. Threadfin spawn at intervals after the water temperature reaches about 70° F. and cease in the fall when the temperature drops below this. The eggs hatch in three days at 80° F. The larvae are long and string-like at first, looking nothing at all like the adults. They develop into slender eel-like fish until about half an inch long, when they assume the appearance of the adult.

Threadfin shad tend to travel in schools. Large numbers congregate at inlets, dam faces, and near obstructions in canals.

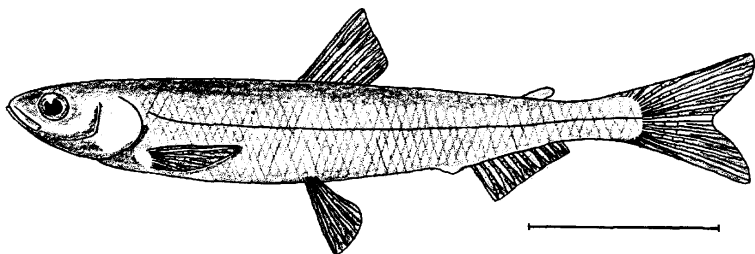
IMPORTANCE

It is an important forage fish, primarily for warmwater game fish such as bass and crappie, and for trout in certain waters.

POND SMELT

Hypomesus olidus

Hypomesus = below middle, referring to ventral fins
olidus = oily



DISTINGUISHING CHARACTERISTICS

The Pond smelt is a small, slender, silvery fish, belonging to the widespread smelt family. It has an adipose fin and a single soft dorsal fin. This species probably does not exceed five inches in length. The mouth does not reach beyond the middle of the eye.

DISTRIBUTION IN CALIFORNIA

The pond smelt ranges from San Francisco Bay northward around the northern Pacific to Japan. It is found in the Sacramento-San Joaquin Delta as far upstream as Stockton and Isleton. An entirely freshwater form was imported from Japan in 1959 as a forage fish for coldwater lakes and reservoirs. It is now present in Spaulding Reservoir, Nevada County and Freshwater Lagoon, Humboldt County.

IMPORTANCE

It is used by predators as a forage fish where it is abundant.

RELATED SPECIES

The Sacramento smelt, *Spirinchus thaleichthys* (*Spirinchus* = ancient name for smelt, *thaleichthys* = rich fish), is found in the San Francisco Bay and Delta region in California. The mouth is larger than in the pond smelt, with the maxillary extending beyond the back of the pupil. The pelvic fins are extremely large. This fish occasionally appears as "whitebait" in markets.

SUCKERS

Suckers and minnows comprise the largest groups of nongame fish in California's inland waters. Although suckers and minnows belong to different families, there is little obvious distinction between the two. Aside from the sucker's unique mouth, most of the characters describing suckers apply equally well to the minnows.

Suckers are bottom-dwellers. They usually have mouths directed downward, with heavy, warty lips. Suckers have no teeth in the mouth, scales on the head, adipose fin, muscular stomach, or spines in the fins. Comb-like teeth are located on a pair of sickle-shaped bones in the throat, where they work against a horny pad at the base of the skull.

Suckers have a wonderful hearing mechanism called the Weberian apparatus, derived from the first three vertebrae. A chain of four little bones on each side connects the air bladder with the lymph sacs of the inner ear. These bones presumably intensify sound impulses to the inner ear, using the air bladder as a collecting device or resonance chamber. The air bladder is connected to the throat.

Suckers inhabit both streams and lakes. Those that live in lakes usually move into streams in the spring to spawn. Occasionally, however, they spawn in lakes. For example, Tahoe suckers have been observed spawning simultaneously in Eagle Lake, Lassen County, and its tributary, Pine Creek.

Suckers' protractile mouths are admirably fitted for gathering food from the bottom mud and off plants, rocks, submerged trees, or other underwater objects. Their food consists mostly of insect larvae, algae and higher plants, and mollusks. They have highly developed senses of touch and taste which enable them to find food under the most adverse conditions.

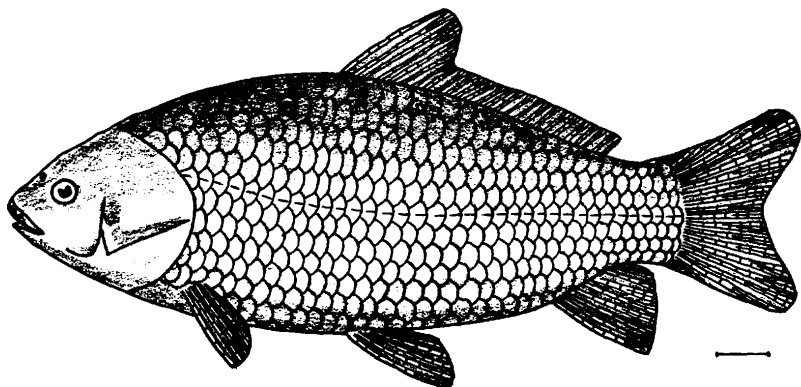
Suckers inhabit almost every kind of freshwater habitat in California. The natural habitat of the Tahoe sucker and mountain-sucker is trout water. The Sacramento western sucker occurs mainly in lowland rivers of the Central Valley. Suckers may approach the brackish water zone in the Sacramento-San Joaquin Delta. However, none tolerates salt water long.

BIGMOUTH BUFFALO

Ictiobus cyprinella

Ictiobus = fish bull

cyprinella = small carp



DISTINGUISHING CHARACTERISTICS

The body is robust and deep and the dorsal fin is long, with more than 25 rays. The mouth is large and oblique, with thin lips. The body color is bluish-green, often with a coppery tint above the lateral line, fading to cream color on the belly.

DISTRIBUTION IN CALIFORNIA

It is present in several reservoirs of the Los Angeles Aqueduct system in Los Angeles and Inyo counties.

GENERAL INFORMATION

This is the only non-native sucker in California. It was introduced illegally in the early 1940's, probably by commercial fishermen who wanted a source of fish nearer to the Los Angeles market. It reportedly reaches a weight of 80 pounds.

IMPORTANCE

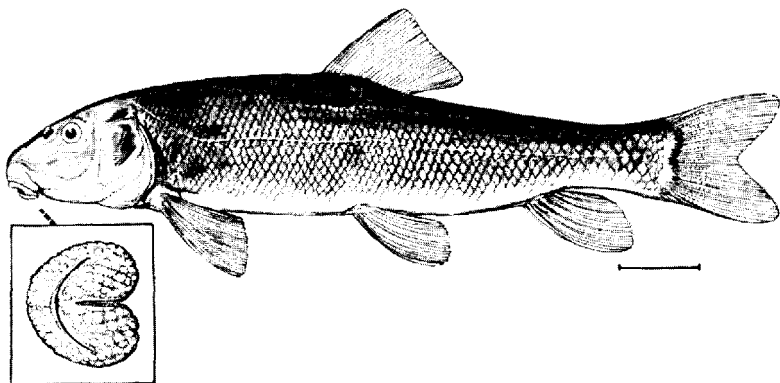
The buffalo almost never takes a hook, but is seined by commercial fishermen. It is an important food fish in the Mississippi drainage.

WESTERN SUCKER

Catostomus occidentalis

Catostomus = inferior mouth

occidentalis = western



DISTINGUISHING CHARACTERISTICS

The mouth is on the under side of the head. The lips are large, pendulous, and covered with papillae. There is a deep indentation in the middle of the lower lip. There are no cutting edges on the jaws.

GENERAL INFORMATION

Western suckers are believed to spawn only in streams, broadcasting their nonadhesive eggs over gravel with no prior preparation. They can often be seen grazing slowly over the bottom, picking up algae and other edible materials. They may reach a length of three feet, but the usual maximum is about two feet.

IMPORTANCE

Suckers may be present in a water and not seriously conflict with the sport fishery. They have, however, been known to compete for food with small trout. They are used as forage by predator fishes and act as scavengers.

RELATED SPECIES

There are eight species, one with two subspecies, of the genus *Catostomus* in California. Six of these species are very similar in appearance.

Sacramento western sucker, *Catostomus occidentalis occidentalis*; Russian River and Sacramento-San Joaquin drainages.

Goose Lake western sucker, *Catostomus occidentalis lacusanserinus* (*lacus* = lake *anserinus* = goose); Goose Lake, Modoc County, drainage.

Klamath largescale sucker, *Catostomus snyderi* (*snyderi* for J. O. Snyder, a California ichthyologist); Klamath River drainage.

Klamath smallscale sucker, *Catostomus rimiculus* (*rimiculus* = small fissure); also occurs in the Klamath River drainage and is the more numerous of the two.

Humboldt sucker, *Catostomus humboldtianus* (*humboldtianus* = Humboldt County); Eel, Mad, and Bear River drainages, Humboldt County.

Modoc sucker, *Catostomus microps* (*microps* = small eye); Pit River drainage in Modoc County.

Monterey sucker, *Catostomus mniotiltus* (*mniotiltus* = moss plucker); streams tributary to Monterey Bay.

The Tahoe sucker, *Catostomus tahoensis* (*tahoensis* = Lake Tahoe), is generally smaller than the western sucker. Males have a red stripe on each side that is prominent during the spawning season. It is found in the waters draining into northern Nevada, such as the Truckee and Carson rivers, Lake Tahoe, and also is now present in some waters of the Sacramento River drainage.

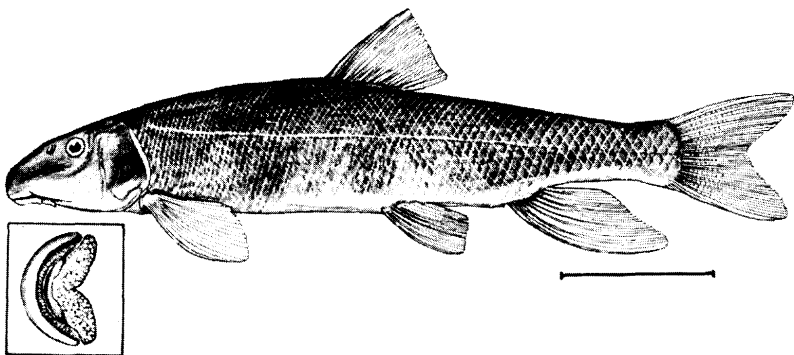
The flannelmouth sucker, *Catostomus latipinnis* (*latipinnis* = broad wing), has a large head, slender body, and a very large, pendulous mouth. It is found only in the Colorado River, where it is quite rare.

SANTA ANA MOUNTAIN-SUCKER

Pantosteus santaanae

Pantosteus = all bone

santaanae = Santa Ana River



DISTINGUISHING CHARACTERISTICS

Mountain-suckers can be distinguished from other kinds of suckers by the mouths. There are deep indentations at the junctions of the upper and lower lips, and broad, flattened, horny cutting edges on the jaws.

DISTRIBUTION IN CALIFORNIA

The Santa Ana mountain-sucker is found in the Santa Ana River and other southern California waters draining into the Pacific Ocean.

INTERESTING FACTS

Mountain-suckers are generally smaller than other species of suckers, individuals over a foot long being uncommon. They are found in rather shallow, cool, running water. They spawn in the spring, like other suckers.

IMPORTANCE

These suckers probably compete with small trout for food, but may be used as forage by larger trout.

RELATED SPECIES

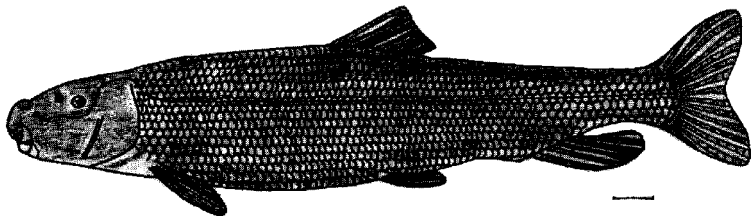
The Lahontan mountain-sucker, *Pantosteus lahontan* (*lahontan* = Lahontan drainage) is found in streams draining into Nevada and the North Fork of the Feather River.

LOST RIVER SUCKER

Deltistes luxatus

Deltistes = like Greek letter delta (Δ)

luxatus = put out of joint



DISTINGUISHING CHARACTERISTICS

The Lost River sucker is a large fish with a terminal, oblique mouth. The lips are thin, with few papillae. The snout has a pronounced hump.

DISTRIBUTION IN CALIFORNIA

It is restricted to a small area in the Klamath River drainage above Copco Dam.

IMPORTANCE

Very little is known of this fish. It probably has little effect on other species of fishes. It is rarely seen, except during spring spawning runs.

RELATED SPECIES

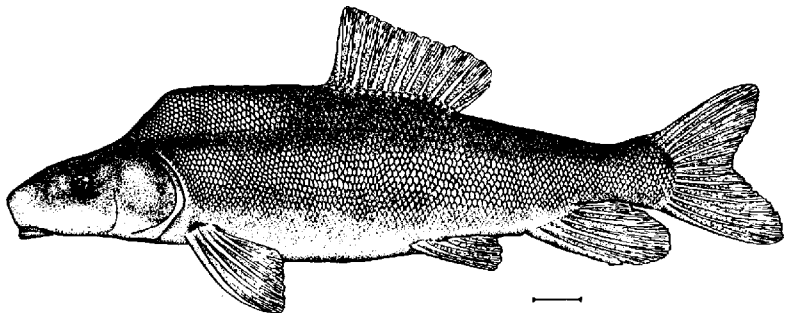
The shortnose sucker, *Chasmistes brevirostris* (*Chasmistes* = to yawn; *brevirostris* = short snout) is another large fish found in the same general area as the Lost River sucker. It differs from the latter in lacking a hump on the snout.

HUMPBACK SUCKER

Xyrauchen texanus

Xyrauchen = razor nape

texanus = Texas



DISTINGUISHING CHARACTERISTICS

This unique fish has a high, sharp-edged hump behind the head in the adult. The head is flattened on top. Otherwise it resembles the western sucker. The body is rather stout. Color is olive-brown above to yellowish on the belly. The head and hump are quite dark in breeding males.

DISTRIBUTION IN CALIFORNIA

It is restricted to the Colorado River drainage.

GENERAL INFORMATION

The humpback sucker grows to large size, reaching three feet in length and a weight of 16 pounds. It feeds on algae and immature insects. It has been known to hybridize with the flannelmouth sucker.

IMPORTANCE

It is now important only when young, as a forage fish. It was probably utilized as food by Indians along the Colorado River in years past, when it was more abundant.